Homework #1 - Tamires Amorim

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load("workspace.RData")

Questions:

1. Can you get the dice to roll a 6 more or less than would be expected? How would you know - what is “more often”?

I rolled the dice 20 times and obtained for Die 1 (3, 6, 1, 2, 1, 3, 1, 3, 4, 6, 1, 1, 2, 6, 2, 5 , 2, 1, 5), and Die 2 (4, 3, 1, 3, 1, 5, 6, 2, 2, 4, 5, 3, 6, 1, 2, 6, 1, 6,3).The first die had “6” three times, and the second one four times. From my perspective, it was more often than I expected, because when I compared with other members of my group I was the only person that obtained more “6” as outcomes. Additionally, because the size of the sample was small it seems that obtaining a 6 at least 3 times was higher than what probability predicts.

1. Can you write some code in R that will simulate a fair roll?

roll\_die = function(n) sample(1:6, n, rep = T)

roll\_die(20)

## [1] 5 5 6 3 3 4 4 2 4 3 5 4 2 1 5 6 4 3 5 6

roll\_die = function(n) sample(1:6, n, rep = T,prob = c(rep(1/7, 5), 2/7))

roll\_die(20)

## [1] 6 3 5 1 1 3 5 4 3 1 1 4 4 4 6 2 6 2 3 5

The first function is a simulation of a fair roll, where we rolled the die 20 times and the number 6 appeared three times. On the second function we manipulate the numbers to create the event “6” more often than on a fair roll. In the real world a die or a pair of dice, can be manipulated by drilling, sanding or heating to weight one side of the dice, this is the only way to increase the chances of obtaining the same number more than expected. Otherwise, since the events are independent within a sample the probability of a 6 to come will always be 1/6, no matter the amount of rolls.

1. Practice R Basics for lecture 1.

#glimpse(acs2017\_ny) try this later  
acs2017\_ny[1:10,1:7]

## AGE female educ\_nohs educ\_hs educ\_somecoll educ\_college educ\_advdeg  
## 1 72 1 0 0 0 0 1  
## 2 72 0 0 0 0 0 1  
## 3 31 0 0 0 0 1 0  
## 4 28 1 0 0 0 1 0  
## 5 54 0 0 0 0 0 1  
## 6 45 1 0 1 0 0 0  
## 7 84 1 0 0 1 0 0  
## 8 71 0 0 0 0 1 0  
## 9 68 1 0 0 1 0 0  
## 10 37 1 1 0 0 0 0

attach(acs2017\_ny)

summary(acs2017\_ny)

## AGE female educ\_nohs educ\_hs   
## Min. : 0.00 Min. :0.0000 Min. :0.000 Min. :0.0000   
## 1st Qu.:22.00 1st Qu.:0.0000 1st Qu.:0.000 1st Qu.:0.0000   
## Median :42.00 Median :1.0000 Median :0.000 Median :0.0000   
## Mean :41.57 Mean :0.5156 Mean :0.271 Mean :0.2804   
## 3rd Qu.:60.00 3rd Qu.:1.0000 3rd Qu.:1.000 3rd Qu.:1.0000   
## Max. :95.00 Max. :1.0000 Max. :1.000 Max. :1.0000   
##   
## educ\_somecoll educ\_college educ\_advdeg SCHOOL   
## Min. :0.000 Min. :0.0000 Min. :0.000 N/A : 5569   
## 1st Qu.:0.000 1st Qu.:0.0000 1st Qu.:0.000 No, not in school:144968   
## Median :0.000 Median :0.0000 Median :0.000 Yes, in school : 46048   
## Mean :0.173 Mean :0.1567 Mean :0.119 Missing : 0   
## 3rd Qu.:0.000 3rd Qu.:0.0000 3rd Qu.:0.000   
## Max. :1.000 Max. :1.0000 Max. :1.000   
##   
## EDUC   
## Grade 12 :55119   
## 4 years of college :30802   
## 5+ years of college :23385   
## 1 year of college :19947   
## Nursery school to grade 4:14240   
## 2 years of college :14065   
## (Other) :39027   
## EDUCD   
## Regular high school diploma :35689   
## Bachelor's degree :30802   
## 1 or more years of college credit, no degree:19947   
## Master's degree :17010   
## Associate's degree, type not specified :14065   
## Some college, but less than 1 year : 9086   
## (Other) :69986   
## DEGFIELD   
## N/A :142398   
## Business : 9802   
## Education Administration and Teaching : 6708   
## Social Sciences : 4836   
## Medical and Health Sciences and Services: 3919   
## Fine Arts : 3491   
## (Other) : 25431   
## DEGFIELDD   
## N/A :142398   
## Psychology : 2926   
## Business Management and Administration: 2501   
## Accounting : 2284   
## General Education : 2238   
## English Language and Literature : 2202   
## (Other) : 42036   
## DEGFIELD2   
## N/A :190425   
## Business : 972   
## Social Sciences : 853   
## Education Administration and Teaching: 611   
## Fine Arts : 465   
## Communications : 352   
## (Other) : 2907   
## DEGFIELD2D   
## N/A :190425   
## Psychology : 284   
## Economics : 260   
## Political Science and Government : 243   
## Business Management and Administration : 217   
## French, German, Latin and Other Common Foreign Language Studies: 205   
## (Other) : 4951   
## PUMA GQ OWNERSHP OWNERSHPD MORTGAGE   
## Min. : 100 Min. :1.000 Min. :0.000 Min. : 0.00 Min. :0.000   
## 1st Qu.:1500 1st Qu.:1.000 1st Qu.:1.000 1st Qu.:12.00 1st Qu.:0.000   
## Median :3201 Median :1.000 Median :1.000 Median :13.00 Median :1.000   
## Mean :2713 Mean :1.148 Mean :1.266 Mean :14.95 Mean :1.453   
## 3rd Qu.:3902 3rd Qu.:1.000 3rd Qu.:2.000 3rd Qu.:22.00 3rd Qu.:3.000   
## Max. :4114 Max. :5.000 Max. :2.000 Max. :22.00 Max. :4.000   
##   
## OWNCOST RENT COSTELEC COSTGAS COSTWATR   
## Min. : 0 Min. : 0 Min. : 0 Min. : 0 Min. : 0   
## 1st Qu.: 1208 1st Qu.: 0 1st Qu.: 960 1st Qu.: 840 1st Qu.: 320   
## Median : 2891 Median : 0 Median :1560 Median :2400 Median :1400   
## Mean :38582 Mean : 393 Mean :2311 Mean :5032 Mean :4836   
## 3rd Qu.:99999 3rd Qu.: 630 3rd Qu.:2520 3rd Qu.:9993 3rd Qu.:9993   
## Max. :99999 Max. :3800 Max. :9997 Max. :9997 Max. :9997   
##   
## COSTFUEL HHINCOME FOODSTMP LINGISOL   
## Min. : 0 Min. : -11800 Min. :1.000 Min. :0.000   
## 1st Qu.:9993 1st Qu.: 41600 1st Qu.:1.000 1st Qu.:1.000   
## Median :9993 Median : 81700 Median :1.000 Median :1.000   
## Mean :7935 Mean : 114902 Mean :1.147 Mean :1.002   
## 3rd Qu.:9993 3rd Qu.: 140900 3rd Qu.:1.000 3rd Qu.:1.000   
## Max. :9997 Max. :2030000 Max. :2.000 Max. :2.000   
## NA's :10630   
## ROOMS BUILTYR2 UNITSSTR FUELHEAT   
## Min. : 0.000 Min. : 0.000 Min. : 0.00 Min. :0.000   
## 1st Qu.: 4.000 1st Qu.: 1.000 1st Qu.: 3.00 1st Qu.:2.000   
## Median : 6.000 Median : 3.000 Median : 3.00 Median :2.000   
## Mean : 5.887 Mean : 3.711 Mean : 4.39 Mean :2.959   
## 3rd Qu.: 8.000 3rd Qu.: 5.000 3rd Qu.: 6.00 3rd Qu.:4.000   
## Max. :16.000 Max. :22.000 Max. :10.00 Max. :9.000   
##   
## SSMC FAMSIZE NCHILD NCHLT5   
## Min. :0.00000 Min. : 1.000 Min. :0.0000 Min. :0.00000   
## 1st Qu.:0.00000 1st Qu.: 2.000 1st Qu.:0.0000 1st Qu.:0.00000   
## Median :0.00000 Median : 3.000 Median :0.0000 Median :0.00000   
## Mean :0.01102 Mean : 3.087 Mean :0.5009 Mean :0.08441   
## 3rd Qu.:0.00000 3rd Qu.: 4.000 3rd Qu.:1.0000 3rd Qu.:0.00000   
## Max. :2.00000 Max. :19.000 Max. :9.0000 Max. :5.00000   
##   
## RELATE RELATED MARST RACE RACED   
## Min. : 1.000 Min. : 101.0 Min. :1.000 Min. :1.00 Min. :100   
## 1st Qu.: 1.000 1st Qu.: 101.0 1st Qu.:1.000 1st Qu.:1.00 1st Qu.:100   
## Median : 2.000 Median : 201.0 Median :5.000 Median :1.00 Median :100   
## Mean : 3.307 Mean : 335.6 Mean :3.742 Mean :2.03 Mean :205   
## 3rd Qu.: 3.000 3rd Qu.: 301.0 3rd Qu.:6.000 3rd Qu.:2.00 3rd Qu.:200   
## Max. :13.000 Max. :1301.0 Max. :6.000 Max. :9.00 Max. :990   
##   
## HISPAN HISPAND BPL   
## Min. :0.0000 Min. : 0.00 New York :128517   
## 1st Qu.:0.0000 1st Qu.: 0.00 West Indies : 8481   
## Median :0.0000 Median : 0.00 China : 4964   
## Mean :0.4153 Mean : 44.75 SOUTH AMERICA: 4957   
## 3rd Qu.:0.0000 3rd Qu.: 0.00 India : 3476   
## Max. :4.0000 Max. :498.00 Pennsylvania : 3303   
## (Other) : 42887   
## BPLD ANCESTR1   
## New York :128517 Not Reported :32021   
## China : 4116 Italian :20577   
## Dominican Republic: 3517 Irish, various subheads,:16388   
## Pennsylvania : 3303 German :12781   
## New Jersey : 3127 African-American : 9559   
## Puerto Rico : 2272 United States : 8209   
## (Other) : 51733 (Other) :97050   
## ANCESTR1D ANCESTR2   
## Not Reported :32021 Not Reported:141487   
## Italian (1990-2000, ACS, PRCS) :20577 German : 9476   
## Irish :15651 Irish : 9238   
## German (1990-2000, ACS/PRCS) :12605 English : 4895   
## African-American (1990-2000, ACS, PRCS): 9559 Italian : 4531   
## United States : 8209 Polish : 3113   
## (Other) :97963 (Other) : 23845   
## ANCESTR2D CITIZEN YRSUSA1   
## Not Reported :141487 Min. :0.0000 Min. : 0.000   
## German (1990-2000, ACS, PRCS) : 9441 1st Qu.:0.0000 1st Qu.: 0.000   
## Irish : 8809 Median :0.0000 Median : 0.000   
## English : 4895 Mean :0.4793 Mean : 5.377   
## Italian (1990-2000, ACS, PRCS): 4531 3rd Qu.:0.0000 3rd Qu.: 0.000   
## Polish : 3113 Max. :3.0000 Max. :92.000   
## (Other) : 24309   
## HCOVANY HCOVPRIV SEX EMPSTAT   
## Min. :1.000 Min. :1.000 Male : 95222 Min. :0.000   
## 1st Qu.:2.000 1st Qu.:1.000 Female:101363 1st Qu.:1.000   
## Median :2.000 Median :2.000 Median :1.000   
## Mean :1.951 Mean :1.691 Mean :1.514   
## 3rd Qu.:2.000 3rd Qu.:2.000 3rd Qu.:3.000   
## Max. :2.000 Max. :2.000 Max. :3.000   
##   
## EMPSTATD LABFORCE OCC IND   
## Min. : 0.00 Min. :0.000 0 : 79987 0 :79987   
## 1st Qu.:10.00 1st Qu.:1.000 2310 : 3494 7860 : 9025   
## Median :10.00 Median :2.000 5700 : 3235 8680 : 6354   
## Mean :15.16 Mean :1.331 430 : 3025 770 : 6279   
## 3rd Qu.:30.00 3rd Qu.:2.000 4720 : 2666 8190 : 5873   
## Max. :30.00 Max. :2.000 4760 : 2563 7870 : 4041   
## (Other):101615 (Other):85026   
## CLASSWKR CLASSWKRD WKSWORK2 UHRSWORK   
## Min. :0.000 Min. : 0.00 Min. :0.000 Min. : 0.00   
## 1st Qu.:0.000 1st Qu.: 0.00 1st Qu.:0.000 1st Qu.: 0.00   
## Median :2.000 Median :22.00 Median :1.000 Median :12.00   
## Mean :1.116 Mean :13.03 Mean :2.701 Mean :19.77   
## 3rd Qu.:2.000 3rd Qu.:22.00 3rd Qu.:6.000 3rd Qu.:40.00   
## Max. :2.000 Max. :29.00 Max. :6.000 Max. :99.00   
##   
## INCTOT FTOTINC INCWAGE POVERTY   
## Min. : -7300 Min. : -11800 Min. : 0 Min. : 0.0   
## 1st Qu.: 8000 1st Qu.: 35550 1st Qu.: 0 1st Qu.:159.0   
## Median : 25000 Median : 74000 Median : 10000 Median :351.0   
## Mean : 45245 Mean : 107111 Mean : 33796 Mean :318.7   
## 3rd Qu.: 56500 3rd Qu.: 132438 3rd Qu.: 47000 3rd Qu.:501.0   
## Max. :1563000 Max. :2030000 Max. :638000 Max. :501.0   
## NA's :31129 NA's :10817 NA's :33427   
## MIGRATE1 MIGRATE1D MIGPLAC1 MIGCOUNTY1   
## Min. :0.000 Min. : 0.00 Min. : 0.000 Min. : 0.000   
## 1st Qu.:1.000 1st Qu.:10.00 1st Qu.: 0.000 1st Qu.: 0.000   
## Median :1.000 Median :10.00 Median : 0.000 Median : 0.000   
## Mean :1.122 Mean :11.51 Mean : 6.184 Mean : 4.117   
## 3rd Qu.:1.000 3rd Qu.:10.00 3rd Qu.: 0.000 3rd Qu.: 0.000   
## Max. :4.000 Max. :40.00 Max. :900.000 Max. :810.000   
##   
## MIGPUMA1 VETSTAT VETSTATD PWPUMA00   
## Min. : 0 Min. :0.0000 Min. : 0.000 Min. : 0   
## 1st Qu.: 0 1st Qu.:1.0000 1st Qu.:11.000 1st Qu.: 0   
## Median : 0 Median :1.0000 Median :11.000 Median : 0   
## Mean : 277 Mean :0.8621 Mean : 9.412 Mean : 1255   
## 3rd Qu.: 0 3rd Qu.:1.0000 3rd Qu.:11.000 3rd Qu.: 3100   
## Max. :70100 Max. :2.0000 Max. :20.000 Max. :59300   
##   
## TRANWORK TRANTIME DEPARTS in\_NYC   
## Min. : 0.000 Min. : 0.00 Min. : 0.0 Min. :0.0000   
## 1st Qu.: 0.000 1st Qu.: 0.00 1st Qu.: 0.0 1st Qu.:0.0000   
## Median : 0.000 Median : 0.00 Median : 0.0 Median :0.0000   
## Mean : 9.725 Mean : 14.75 Mean : 373.3 Mean :0.3615   
## 3rd Qu.:10.000 3rd Qu.: 20.00 3rd Qu.: 732.0 3rd Qu.:1.0000   
## Max. :70.000 Max. :138.00 Max. :2345.0 Max. :1.0000   
##   
## in\_Bronx in\_Manhattan in\_StatenI in\_Brooklyn   
## Min. :0.0000 Min. :0.00000 Min. :0.00000 Min. :0.000   
## 1st Qu.:0.0000 1st Qu.:0.00000 1st Qu.:0.00000 1st Qu.:0.000   
## Median :0.0000 Median :0.00000 Median :0.00000 Median :0.000   
## Mean :0.0538 Mean :0.04981 Mean :0.02084 Mean :0.126   
## 3rd Qu.:0.0000 3rd Qu.:0.00000 3rd Qu.:0.00000 3rd Qu.:0.000   
## Max. :1.0000 Max. :1.00000 Max. :1.00000 Max. :1.000   
##   
## in\_Queens in\_Westchester in\_Nassau Hispanic   
## Min. :0.0000 Min. :0.00000 Min. :0.00000 Min. :0.0000   
## 1st Qu.:0.0000 1st Qu.:0.00000 1st Qu.:0.00000 1st Qu.:0.0000   
## Median :0.0000 Median :0.00000 Median :0.00000 Median :0.0000   
## Mean :0.1111 Mean :0.04413 Mean :0.07032 Mean :0.1387   
## 3rd Qu.:0.0000 3rd Qu.:0.00000 3rd Qu.:0.00000 3rd Qu.:0.0000   
## Max. :1.0000 Max. :1.00000 Max. :1.00000 Max. :1.0000   
##   
## Hisp\_Mex Hisp\_PR Hisp\_Cuban Hisp\_DomR   
## Min. :0.00000 Min. :0.0000 Min. :0.000000 Min. :0.00000   
## 1st Qu.:0.00000 1st Qu.:0.0000 1st Qu.:0.000000 1st Qu.:0.00000   
## Median :0.00000 Median :0.0000 Median :0.000000 Median :0.00000   
## Mean :0.01626 Mean :0.0436 Mean :0.003403 Mean :0.02827   
## 3rd Qu.:0.00000 3rd Qu.:0.0000 3rd Qu.:0.000000 3rd Qu.:0.00000   
## Max. :1.00000 Max. :1.0000 Max. :1.000000 Max. :1.00000   
##   
## white AfAm Amindian Asian   
## Min. :0.0000 Min. :0.000 Min. :0.000000 Min. :0.00000   
## 1st Qu.:0.0000 1st Qu.:0.000 1st Qu.:0.000000 1st Qu.:0.00000   
## Median :1.0000 Median :0.000 Median :0.000000 Median :0.00000   
## Mean :0.6997 Mean :0.125 Mean :0.003779 Mean :0.08656   
## 3rd Qu.:1.0000 3rd Qu.:0.000 3rd Qu.:0.000000 3rd Qu.:0.00000   
## Max. :1.0000 Max. :1.000 Max. :1.000000 Max. :1.00000   
##   
## race\_oth unmarried veteran has\_AnyHealthIns  
## Min. :0.0000 Min. :0.00 Min. :0.00000 Min. :0.0000   
## 1st Qu.:0.0000 1st Qu.:0.00 1st Qu.:0.00000 1st Qu.:1.0000   
## Median :0.0000 Median :0.00 Median :0.00000 Median :1.0000   
## Mean :0.1324 Mean :0.45 Mean :0.04443 Mean :0.9513   
## 3rd Qu.:0.0000 3rd Qu.:1.00 3rd Qu.:0.00000 3rd Qu.:1.0000   
## Max. :1.0000 Max. :1.00 Max. :1.00000 Max. :1.0000   
##   
## has\_PvtHealthIns Commute\_car Commute\_bus Commute\_subway   
## Min. :0.0000 Min. :0.0000 Min. :0.00000 Min. :0.00000   
## 1st Qu.:0.0000 1st Qu.:0.0000 1st Qu.:0.00000 1st Qu.:0.00000   
## Median :1.0000 Median :0.0000 Median :0.00000 Median :0.00000   
## Mean :0.6906 Mean :0.2997 Mean :0.02162 Mean :0.07468   
## 3rd Qu.:1.0000 3rd Qu.:1.0000 3rd Qu.:0.00000 3rd Qu.:0.00000   
## Max. :1.0000 Max. :1.0000 Max. :1.00000 Max. :1.00000   
##   
## Commute\_rail Commute\_other below\_povertyline below\_150poverty  
## Min. :0.00000 Min. :0.00000 Min. :0.000 Min. :0.0000   
## 1st Qu.:0.00000 1st Qu.:0.00000 1st Qu.:0.000 1st Qu.:0.0000   
## Median :0.00000 Median :0.00000 Median :0.000 Median :0.0000   
## Mean :0.01332 Mean :0.05506 Mean :0.122 Mean :0.1965   
## 3rd Qu.:0.00000 3rd Qu.:0.00000 3rd Qu.:0.000 3rd Qu.:0.0000   
## Max. :1.00000 Max. :1.00000 Max. :1.000 Max. :1.0000   
##   
## below\_200poverty foodstamps   
## Min. :0.0000 Min. :0.0000   
## 1st Qu.:0.0000 1st Qu.:0.0000   
## Median :0.0000 Median :0.0000   
## Mean :0.2676 Mean :0.1465   
## 3rd Qu.:1.0000 3rd Qu.:0.0000   
## Max. :1.0000 Max. :1.0000   
##

1. Tell me something else interesting, that you learned from the data, for example about educational attainments in different neighborhoods in the city. Are there surprises for you?

It was interesting to observe on the data that an average of 0.3615 of people have been educated in New York City, however, educational attainments in different neighborhoods in the New York city is different. For example, in Bronx, the mean is 0.0538, which is much lower than the average for New York as a whole, serving as information to prove the the low level of education in the borough. In contrast, Manhattan has a mean of 0.04981, Staten Island 0.02084, Brooklyn, the mean is 0.126 and In Queens, the mean is 0.1111.

print(NN\_obs <- length(AGE))

## [1] 196585

summary(AGE[female == 1])

## Min. 1st Qu. Median Mean 3rd Qu. Max.   
## 0.00 23.00 44.00 42.72 61.00 95.00

summary(AGE[!female])

## Min. 1st Qu. Median Mean 3rd Qu. Max.   
## 0.00 21.00 40.00 40.35 59.00 95.00

# here i want to find average ages of men and women  
mean(AGE[female == 1])

## [1] 42.71629

sd(AGE[female == 1])

## [1] 23.72012

mean(AGE[!female])

## [1] 40.35398

sd(AGE[!female])

## [1] 23.1098

1. Differences in means can be complicated. Find the mean return on SP500 index (choose a time period). What is the mean return on days when the previous day’s return was positive? When the previous 2 days were positive? Negative? Now read about “hot hands fallacy” and tell if you think that helps investment strategy. (You might start with this tweet, and read the papers referenced.)

It was collected data from from 08.06.2020-09.10.2020 to analyze the SP500 index returns. The mean of the daily returns is 0.000992144 (calculated in Excel) as follow:

Date | Open | High | Low | Close | daily return |  
Sept. 10, 2020 | 3412.56 | 3425.55 | 3329.25 | 3339.19 | 0.023678 |  
Sept. 9, 2020 | 3369.82 | 3424.77 | 3366.84 | 3398.96 | 0.017584791 |  
Sept. 8, 2020 | 3371.88 | 3379.97 | 3329.27 | 3331.84 | -0.020145025 |  
Sept. 4, 2020 | 3453.6 | 3479.15 | 3349.63 | 3426.96 | 0.027756379 |  
Sept. 3, 2020 | 3564.74 | 3564.85 | 3427.41 | 3455.06 | 0.008132999 |  
Sept. 2, 2020 | 3543.76 | 3588.11 | 3535.23 | 3580.84 | 0.035125836 |  
Sept. 1, 2020 | 3507.44 | 3528.03 | 3494.6 | 3526.65 | -0.015365857 |  
Aug. 31, 2020 | 3509.73 | 3514.77 | 3493.25 | 3500.31 | -0.007525048 |  
Aug. 28, 2020 | 3494.69 | 3509.23 | 3484.32 | 3508.01 | 0.002194977 |  
Aug. 27, 2020 | 3485.14 | 3501.38 | 3468.35 | 3484.55 | -0.006732577 |  
Aug. 26, 2020 | 3449.97 | 3481.07 | 3444.15 | 3478.73 | -0.001673024 |  
Aug. 25, 2020 | 3435.95 | 3444.21 | 3425.84 | 3443.62 | -0.010195666 |  
Aug. 24, 2020 | 3418.09 | 3432.09 | 3413.13 | 3431.28 | -0.003596326 |  
Aug. 21, 2020 | 3386.01 | 3399.96 | 3379.31 | 3397.16 | -0.010043684 |  
Aug. 20, 2020 | 3360.48 | 3390.8 | 3354.69 | 3385.51 | -0.003441136 |  
Aug. 19, 2020 | 3392.51 | 3399.54 | 3369.66 | 3374.85 | -0.003158659 |  
Aug. 18, 2020 | 3387.04 | 3395.06 | 3370.15 | 3389.78 | 0.004404416 |  
Aug. 17, 2020 | 3380.86 | 3387.59 | 3379.22 | 3381.99 | -0.002303378 |  
Aug. 14, 2020 | 3368.66 | 3378.51 | 3361.64 | 3372.85 | -0.002709874 |  
Aug. 13, 2020 | 3372.95 | 3387.24 | 3363.35 | 3373.43 | 0.000171932 |  
Aug. 12, 2020 | 3355.46 | 3387.89 | 3355.46 | 3380.35 | 0.002047125 |  
Aug. 11, 2020 | 3370.34 | 3381.01 | 3326.44 | 3333.69 | -0.013996502 |  
Aug. 10, 2020 | 3356.04 | 3363.29 | 3335.44 | 3360.47 | 0.007969123 |  
Aug. 7, 2020 | 3340.05 | 3352.54 | 3328.72 | 3351.28 | -0.002742236 |  
Aug. 6, 2020 | 3323.17 | 3351.03 | 3318.14 | 3349.16 | -0.000632995 |

The mean return on S&P500 index from August 26th to September 10th presented 11 days with positive return against 15 days with negative returns. There was no clear sequence on the positive or negative daily mean return. For instance, from September 2nd to September 4th the daily return were positive, although on September 8 it was negative, then followed by positive returns for the remaining days. In the decision-making process, investors can look for past returns of the S&P500 index and use it as a source of information for predicting future outcomes. Although, as studies has shown this kind of prediction can be biased, because streaks of last outcomes do not mean continued success. This assumption is called “Hot hands Fallacy”, a term brought from the belief that basketball players that score more in a game have greater probability of keeping their scores in the next games, which is not true, given the randomness of the event, according to JOSHUA B. MILLER and ADAM SANJURJO in the paper SURPRISED BY THE HOT HAND FALLACY? A TRUTH IN THE LAW OF SMALL NUMBERS: “…the bias can be leveraged to manipulate people into believing that the outcomes of an unpredictable process can be predicted at rates better than chance”. When the investor needs to make a quick decision it might be the easiest approach, although it will be rendered to bias and errors in judgment, and may not be give the most accurate information, leading to the wrong investment strategy.

save.image("workspace.RData")